Attention-Aware Rendering, Mobile Graphics and Games

Ann McNamara
Texas A&M University

Katerina Mania
Technical University of Crete

George Alex Koulieris
Technical University of Crete

Laurent Itti
University of Southern California

Figure 1: *Top: Subtle Gaze direction, input image for modulation (left). Gaze distribution for modulated image (right). White crosses indicate locations preselected by researchers for modulation [Bailey, McNamara et al. 2009]. Bottom Left: Schematic of the iLab Neuromorphic Vision, a comprehensive set of C++ classes for the development of neuromorphic models of vision [Baldi and Itti 2010]. Bottom Right: In a Search task, a High Level Saliency predictor highlights a vase at a consistent with the context location signifying an easy recovery [Koulieris et al. 2013].*

Rendering and design efficiency become critical when deploying computer graphics to mobile devices and games. This course addresses novel approaches to leverage models of visual attention, based on low and high level scene features, to propel attention-aware rendering computation. The result: perceptually-optimized scalable algorithms for mobile platforms and game design.

Recent research on low-level attention algorithms whose architecture and function is closely inspired from biological brains will be reviewed [Baldi and Itti 2010]. High level saliency instigated by cognitive information such as scene context and topology will be discussed [Koulieris et al. 2013]. Prediction of attention can significantly improve many aspects of computer graphics and games. Image synthesis can be accelerated by reducing computation on non-attended scene regions. Subtle gaze manipulation [Bailey et al. 2009] improves mammography training and spatial recall. We will also review attention as modulator of empathy during interactive 3D neuroscientific experiments in the fMRI [Mavromihelaki et al. 2014].

The course will showcase through interactive content how employing a visual attention model leads to efficient game design. Many games rely on search or target detection tasks to solve riddles or find game objects. Adjusting the difficulty of a level could be facilitated by relocating objects estimated to attract attention. By incorporating visual attention estimation, perceptually optimized renderers for mobile platforms can dynamically ignore perceptually non-important details. Modern video games and interactive applications are simultaneously deployed for computers, consoles and mobile devices of diverse computational power. Complex effects including but not limited to complex refraction and subsurface scattering that are standard in desktop computers, could also scale efficiently in portable devices if attention-aware. Examples such as the integration of a high level saliency model in a LOD manager, enabling complex effects in low-power devices by applying them in regions expected to be attended to, are going to be demonstrated.

This course delivers a cutting-edge overview of attention models and their application in rendering, mobile technology and gaming platforms [Mavromihelaki et al. 2014].

Speakers

Ann McNamara Texas A&M University
Katerina Mania Technical University of Crete
George Alex Koulieris Technical University of Crete
Laurent Itti University of Southern California

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